

REMARKS/ARGUMENTS

Reconsideration of this application is requested. Claims 1-7 remain active in the application subsequent to entry of this Amendment.

The claims have been amended in order to more particularly point out and distinctly claim that which applicants regard as their invention and to attend to minor informalities. More specifically, independent claims 1-3 have been amended to include the description found on page 9, lines 15-21 of the specification while minor adjustments have been made to claims 4, 5 and 7.

Applicants' claims are directed to methods of manufacturing a positive active material for an alkaline storage battery containing nickel hydroxide as the main component. The procedure includes an oxidizing step followed by a reducing step.

As a basis of the present invention, the inventors have found, in the case of chemically oxidizing nickel hydroxide to produce higher-order nickel hydroxide for the positive pole active material, a drawback is that γ -NiOOH, which is difficult to discharge electrochemically, is generated together with β -NiOOH, which is easily dischargeable electrochemically, in nickel hydroxide. The presence of γ -NiOOH hinders the electroconductivity of the resulting higher-order nickel hydroxide, thereby deteriorating utilization and decreasing the discharge capacity when an alkali battery is constructed with a positive pole containing the same.

In order to overcome this drawback, the inventors have found it effective to employ a method of excessively chemically oxidizing nickel hydroxide to positively generate γ -NiOOH, which is difficult to discharge electrochemically, together with β -NiOOH and selectively reducing the undesired γ -NiOOH in a successful reducing step.

The higher-order nickel hydroxide obtained by this method, in comparison with the higher-order nickel hydroxide prepared in a conventional method of chemical oxidation only, without the reducing step, has a lower ratio of γ -NiOOH. Thus while the entire amount of NiOOH contained in the higher-order nickel hydroxide remains the

same, the ratio of β -NiOOH easily dischargeable electrochemically increases – see the attached sketch.

The inventors have prepared an alkali battery having a positive pole containing higher-order nickel hydroxide prepared by their oxidizing/reducing process, and have confirmed an increase not only in the discharge capacity (as noted in Ovshinsky) but also in the high-rate discharge capacity. The results of these studies are summarized in Tables 1 and 2 of applicants' specification.

Original claims 1-3 and 5-7 have attracted a rejection of alleged anticipation on the basis of Ovshinsky et al U.S. 5,523,182 while original claim 4 has attracted a rejection of alleged "obviousness" over this reference considered in combination with JP 11-144723. Both of these rejections are traversed in that neither of the references, nor their combination, disclose or suggest an oxidizing step in which the nickel-hydroxide is immersed in an alkali solution maintained at 40 to 60°C and by adding an oxidant to this alkali solution. Nor do either of the references address the problems to which the present invention is directed.

The drawback of generation of γ -NiOOH at chemical oxidation and the technical concept of positively generating γ -NiOOH and selectively reducing γ -NiOOH in the succeeding reducing step as recognized by the present applicants – are not disclosed or suggested in the Ovshinsky reference.

Applicants' claims are above amended to specify a difference in conditions of the present invention and the cited references, thereby clarifying the difference in the occupancy rate of γ -NiOOH between the invention and the cited references.

Based upon applicants' study of the applied references neither USP 5,523,182 nor JP-A No. 11-144723 teach maintaining the processing liquid, for the higher-order processing of nickel hydroxide at 40-60°C, which is a condition for positively generating γ -NiOOH. This feature represents a distinct difference present in γ -NiOOH in the higher-order nickel hydroxide between the present invention and the cited references.

KIHARA et al.
Appl. No. 09/925,735
April 14, 2004

For the above reasons it is respectfully submitted that the claims of this application define inventive subject matter. Reconsideration and allowance are solicited. If the examiner has any questions or requires further information, please contact the undersigned by telephone.

Respectfully submitted,

NIXON & VANDERHYE P.C.

By: _____



Arthur R. Crawford
Reg. No. 25,327

ARC:eaw
1100 North Glebe Road, 8th Floor
Arlington, VA 22201-4714
Telephone: (703) 816-4000
Facsimile: (703) 816-4100